

Conditional statement

If $\angle 1$ and $\angle 2$ are vertical angles, then $\angle 1 \cong \angle 2$.

Contrapositive

If $\angle 1$ is not congruent to $\angle 2$, then $\angle 1$ and $\angle 2$ are not vertical angles.

5-3 Indirect Proof

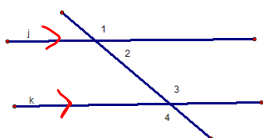
Indirect Proof

1. Assume conclusion is false
2. Reason until you contradict the given
3. State assumption is false

Example 1:

Given: $\angle 1 \not\cong \angle 4$

Prove: $\angle 2$ and $\angle 3$ are not supplementary



① Assume $\angle 2 + \angle 3$ are supplementary.

② Then $j \parallel k$ b/c if s-side int \angle s suppl. then the lines are \parallel .
then $\angle 1 \cong \angle 4$ b/c of \parallel ,
th alt. ext $\angle \cong$ s

* Contradicts our given

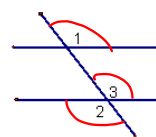
③ Our assumption is false

$\rightarrow \therefore \angle 2 + \angle 3$ are not suppl.
therefore

Example 2

Given: $\angle 1 \not\cong \angle 2$

Prove: $\angle 1 \not\cong \angle 3$



① Assume $\angle 1 \cong \angle 3$

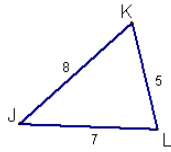
② then $\angle 3 \cong \angle 2$ b/c vert. \angle s \cong
then $\angle 1 \cong \angle 2$ b/c transitive

* Contradicts the given

③ Our assumption is false
 $\therefore \angle 1 \not\cong \angle 3$

Example 3

Given: picture

Prove: $m\angle K < m\angle L$ 

- ① Assume $m\angle K > m\angle L$ } ① Assume $m\angle K = m\angle L$
 ② Then $JL > JK$ (thm 5.10) } ② Then $JL = JK$ (conv. of thm)
 *Contradicts given } *Contradicts given
 ③ Our assumptions are false
 $\therefore m\angle K < m\angle L$

Example 4

$$\text{Given: } \frac{1}{2y+4} = 20$$

Prove: $y \neq -2$

- ① Assume $y = -2$
 ② $\frac{1}{2(-2)+4} = \frac{1}{0}$
 Impossible
 *Contradicts the given
 ③ Our assumption is false
 $\therefore y \neq -2$

Homework

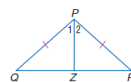
p. 258 #s 13-17, 19, 21, 22
 not 15

Write the assumption you would make to start an indirect proof of each statement.

13. $\overline{PQ} \cong \overline{ST}$ 14. If $3x > 12$, then $x > 4$.

15. If a rational number is any number that can be expressed as $\frac{a}{b}$, where a and b are integers, and $b \neq 0$, 6 is a rational number.

16. A median of an isosceles triangle is also an altitude.

17. Points P , Q , and R are collinear.**PROOF** Write an indirect proof.19. Given: $\frac{1}{a} < 0$ Prove: a is negative.21. Given: $\overline{PQ} \cong \overline{PR}$ $\angle 1 \neq \angle 2$ Prove: \overline{PZ} is not a median of $\triangle PQR$.22. Given: $m\angle 2 \neq m\angle 1$ Prove: $\ell \parallel m$ 